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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/658,410	09/10/2003	Koji Miyake	3327.2275-01	3212
22852	7590	07/21/2004	EXAMINER	
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP 1300 I STREET, NW WASHINGTON, DC 20005			MCDONALD, RODNEY GLENN	
			ART UNIT	PAPER NUMBER
			1753	

DATE MAILED: 07/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/658,410	MIYAKE, KOJI	
	Examiner	Art Unit	
	Rodney G. McDonald	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 9-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 9 and 10 is/are rejected.
- 7) ☒ Claim(s) 11 and 12 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 10/107,363.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____.  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>2/2004</u> .  | 6) <input type="checkbox"/> Other: ____.                                    |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Welty (U.S. Pat. 5,480,527).

Welty teach a rectangular vacuum-arc plasma source which can be integrated into a ***vacuum system***. (See Abstract; Column 12 lines 32-34) With reference to the schematic view of FIG. 2, one preferred embodiment of this invention can be understood to include ***a cathode target 30 on cathode body 31. Target 30 has an evaporable surface 33*** of substantially rectangular shape. In a preferred embodiment, the cathode 30 is carbon, but it may be composed of any suitable evaporable material. The cathode body 31 is mounted on a holder 32 and situated in entrance arm 36 of plasma duct 34. ***Cathode 30 is connected to the negative output of an arc power supply 28***, and plasma duct 34 (which also serves as an anode) is connected to the positive output of the arc power supply. ***An arc striker 35 is provided for igniting an arc discharge between cathode 30 and anode 34***. Cathode 30 and evaporable surface 33 may also be surrounded by insulators 86 (reference FIG. 4). With continued reference to FIG. 4, it may be seen that an internal electrode 82 is mounted within the plasma duct 34, as is sensor 84. (Column 9 lines 10-25)

**A set of electromagnets is disposed about plasma duct 34.** Magnet 46 is connected to coil power supply 52 and is located near the entrance arm 36 of the plasma duct. Magnet 48 is connected to coil power supply 52 and is located near the outer radius 39 of the bend in plasma duct 34. Magnet 50 is a solenoid connected to coil power supply 52 and it wraps around a portion of the exit arm 38 of the plasma duct. The perspective view of FIG. 3 shows magnets 46, 48 and 50 in relation to the plasma duct 34, with magnet 46 near the entrance arm 38, magnet 48 near the outer radius 39 of the bend, and magnet 50 coiled around the exit arm 38. (Column 9 lines 40-50)

A bias voltage may be applied to the substrate 44, and **the substrate may be conventionally rotated** and/or translated during deposition. (Column 9 lines 65-68)

The **sensors 54A and 54B** (reference FIG. 5) are able to sense an arc spot and to produce a signal whenever the arc spot approaches either the left or right end, respectively, of the cathode 30. Sensors 54 may, for example, consist of electrically isolated wires extending into the plasma duct 34, with the wires connected to the anode through a resistor (not shown) of, say, 1000 ohms, thus providing an electrical voltage whenever the arc approaches the wire. Alternatively, sensors 54 may comprise a light-sensitive diode which detects the optical emission from the arc jet, or a magnetic field detector which senses the magnetic field of the arc. **The coil power supply 52 (reference FIG. 2) has a switch 53 capable of reversing the direction of current flow through the magnets, and it is connected by conventional control means (not shown) to the sensors 54 so as to actuate a magnetic field reversal. The**

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***magnetic field reversal*** can occur simultaneously in all of the magnets and will ***reverse the direction of the magnetic flux lines*** without substantially changing the shape of the flux lines or their orientation with respect to the plasma duct. ***Alternatively, only one or both of magnets 46 and magnet 48 may be reversed.*** (Column 10 lines 54-68; Column 11 lines 1-7)

Welty teach that it is possible to ***reflect ions away from the duct wall*** by a second method, namely by creating near the wall a region in which the magnetic flux lines converge as they approach the wall in an approximately perpendicular direction, creating a region known ***as a magnetic mirror. Plasma electrons approaching the wall are reflected or retarded as they enter the region on converging flux lines, creating an electron density gradient resulting in an electric field which reflects the plasma ions as well.*** (Column 7 lines 31-44)

***Reversal of the polarity of the magnetic mirror field, and thus the field component parallel to the target surface, causes the direction of travel of the arc on the target surface to reverse without changing the shape or function of the mirror field.*** (Column 7 lines 63-68)

The combination and superposition of independently variable magnetic field sources providing a solenoidal magnetic field region in the exit arm of the plasma duct, a "bumper" field region near the outer radius of the bend in the duct, and a magnetic mirror field region in the entrance arm of the duct adjacent to the cathode provide sufficient adjustability to allow optimization of plasma transport through the duct for a wide variety of target materials. (Column 8 lines 1-8)

The sensors 54 sense the arc spot, and produce a signal whenever the arc spot approaches either end of the evaporable surface. The signal from the sensors actuates a control system, which ***reverses the current in the coil power supply 52, thereby reversing the direction of the magnetic flux lines without changing the shape of the flux lines or their orientation with respect to plasma duct 34. Thus, the arc spot is urged, not only to scan in a linear direction over the surface of the rectangular cathode 30, but to scan back and forth in a generally end to end path.***

(Column 11 lines 55-64)

#### ***Allowable Subject Matter***

Claims 11 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claim 11 is indicated as being allowable over the prior art of record because the prior art of record does not teach measuring a thickness of a film formed by the plasma at a plurality of points in the vicinity of the substrate, wherein the flowing direction of the coil current is reversed when a difference between film thickness values thus measured exceeds a predetermined value.

Claim 12 is indicated as being allowable over the prior art of record because the prior art of record does not teach measuring ion currents at a plurality of points in the vicinity of the substrate, wherein the flowing direction of the coil current is reversed

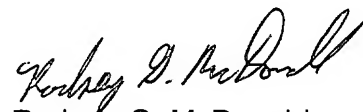
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when a difference between current values thus measured exceeds a predetermined value.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
July 14, 2004